

ADAPTIVE DYNAMIC RANGE RECEIVER FOR MRI

The present application is a continuation of Application Number 09/877,385, filed on June 22, 2001, ^{is now a U.S. patent 6,621,433} which is incorporated by reference herein.

Field of the Invention

[0001] The present invention is directed to apparatus and methods for analog to digital conversion of signal characterized by wide dynamic range, and particularly to such apparatus and methods that are low in cost and require minimal calibration.

Background of the Invention

[0002] Quantization noise is a type of noise that results from error in the conversion of an analog signal to a digital form by an analog-to-digital converter (ADC). Digital signals have discrete steps in amplitude, while analog signals can be smooth. So while an analog signal may rise or fall like a ramp, a digital signal rises or falls in discrete steps, like a staircase. When a smooth analog signal is transformed into a signal with steps, a certain amount of error results because portions of the analog signal between the steps must be converted to a signal that skips from one step to another rather than smoothly varying between them. This makes a smooth analog signal look like a noisy analog signal. To eliminate this type of additional noise, designers try to use ADCs with a lot of steps; the more steps, the finer the graininess caused by jumping between steps. However, there are practical reasons for using the ADC with the smallest number of steps possible. One is that using more steps can make the downstream equipment that uses the digital signal very expensive because each signal level must be encoded by a large amount of data.

[0003] The design of signal conditioning systems involving the conversion of analog signals to digital form invariably confronts the issue of quantization noise, although in most cases, it is just a routine step in the design process. But in some kinds of signal analysis systems,